



# Green Prefab: Civil Engineering Hub in Microsoft Windows Azure

MICROSOFT CLOUD FUTURES 2012 May 7, 2012, Berkeley, USA



**Furio Barzon**  
co-founder & CEO



Partners:





# Emerging market in the World

greenprefab



Radziner  
California USA



Snøhetta  
Norway



Gehry  
Germany



Concko Gautier  
Holland



Resolution4A  
USA



Romero  
USA



Fiberline  
Switzerland



Bioarchitettura®

# green buildings



Case Legno Trentino



Ikea  
Sweden



Oppenheim  
Florida USA



Osaka Gas  
Japan



Fisher  
UAE



Cis  
England



Toyota  
Japan



Lot-ek  
California USA



# Emerging market in the World

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Fiberline  
Switzerland

- World market of the Green Buildings:  
**\$ 406,000,000,000** in 2015
- Annual growth rate: **5.24%**



Ikea  
Sweden



Oppenheim  
Florida USA



Osaka Gas  
Japan



Fisher  
UAE



Cis  
England



Toyota  
Japan

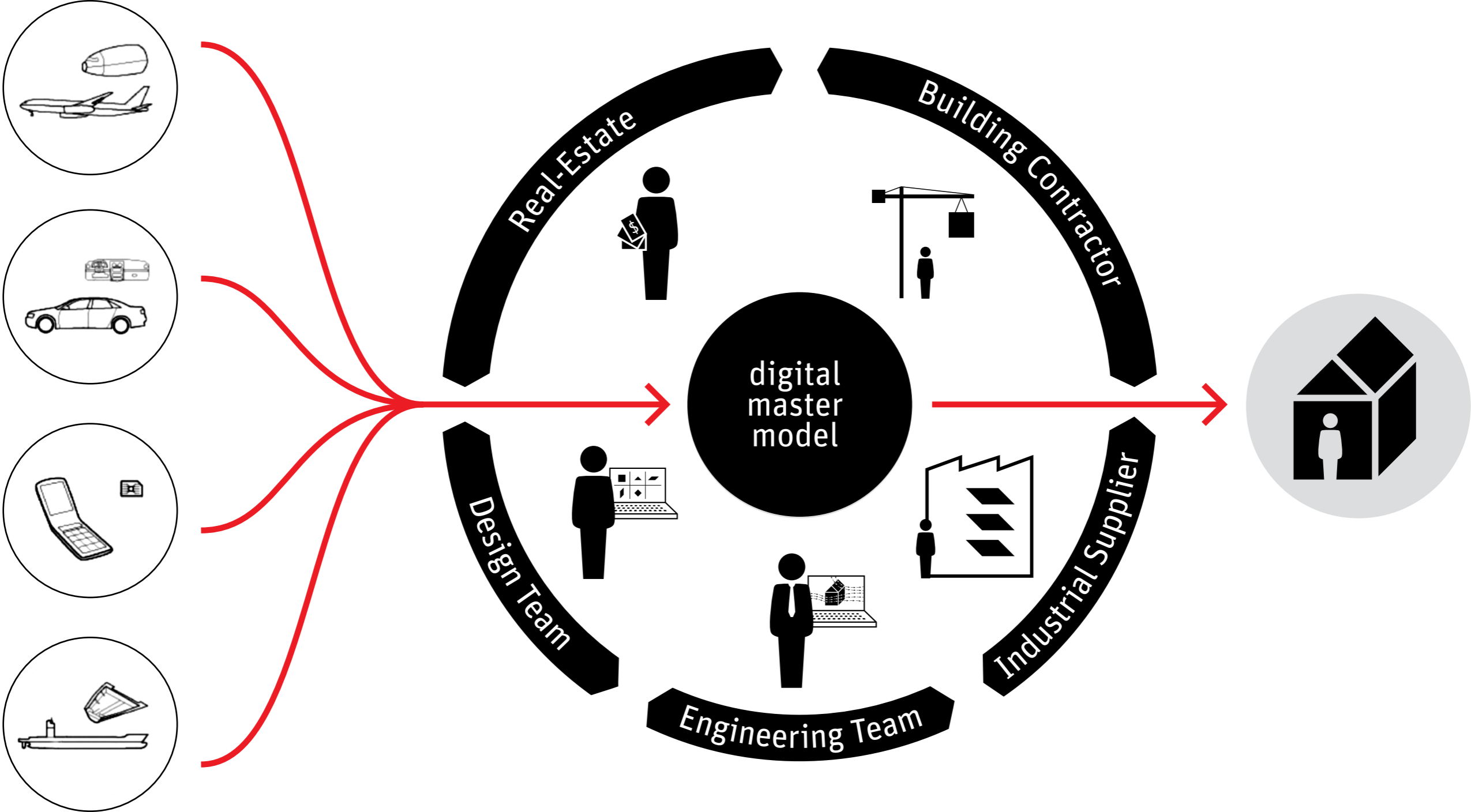


Lot-ek  
California USA

# Green Prefab solution

PREFABRICATION \* DIGITAL MASTER MODEL \* LIFE-CYCLE MANAGEMENT

greenprefab



technology transfer

stakeholders sharing master model compliant to prefabrication production

green building



# Prototype up-and-running

greenprefab



# green prefab



[www.greenprefab.com](http://www.greenprefab.com)

The screenshot shows a web browser window titled "Green Prefab" with the URL <http://www.greenprefab.com/index.php>. The browser's address bar includes a search engine icon and the text "ternazionale francia". Below the browser window, the website header features the "green prefab" logo, navigation links for "prodotti", "progetti", and "community", and a language selector for "ENG" and "ITA" with a link to "accedi/registrati".

The main content area is divided into three columns:

- prodotti**: A grid of product images and descriptions:
  - MURI ESTERNI BBS Wall T HolzBuild inc.
  - PARAPETTI Linea Vetro Veneta Serramenti
  - PORTE White Veneta Serramenti
  - FINESTRE Profil-Design Veneta Serramenti
  - PORTE Plana Veneta Serramenti
  - MURI ESTERNI Talkong external panel Talkong Panel Industry Corp.
- progetti**: A list of project images and descriptions:
  - GOVERNMENT, ADMINISTRATIVE Binder Woodcenter Matteo Thun & Partners Kösching - Ingolstadt, Germany
  - SINGLE FAMILY DWELLING Talkong house Cina
  - MULTIPLE FAMILY DWELLING Ancillotto Studio RBA / Ruggero Baldasso Architect San Donà di Piave - Venezia, Italia, 2008
- community**: A featured article titled "Studio RBA new community member" with a photo of an office and text describing RBA's services.

At the bottom, a banner features the text "everyone can live and work in modern, ecological and affordable buildings" next to a 3D architectural model. To the right, a process flow diagram shows "download" (with a download icon), "design" (with a laptop icon), and "build" (with building icons). Below the diagram are links for "> watch the demo" and "> how it works".

The footer contains navigation links: "about | network | contacts | blog" and a copyright notice: "© Collaboratorio".

GPF current version available: demo version

# 1. Prefabrication

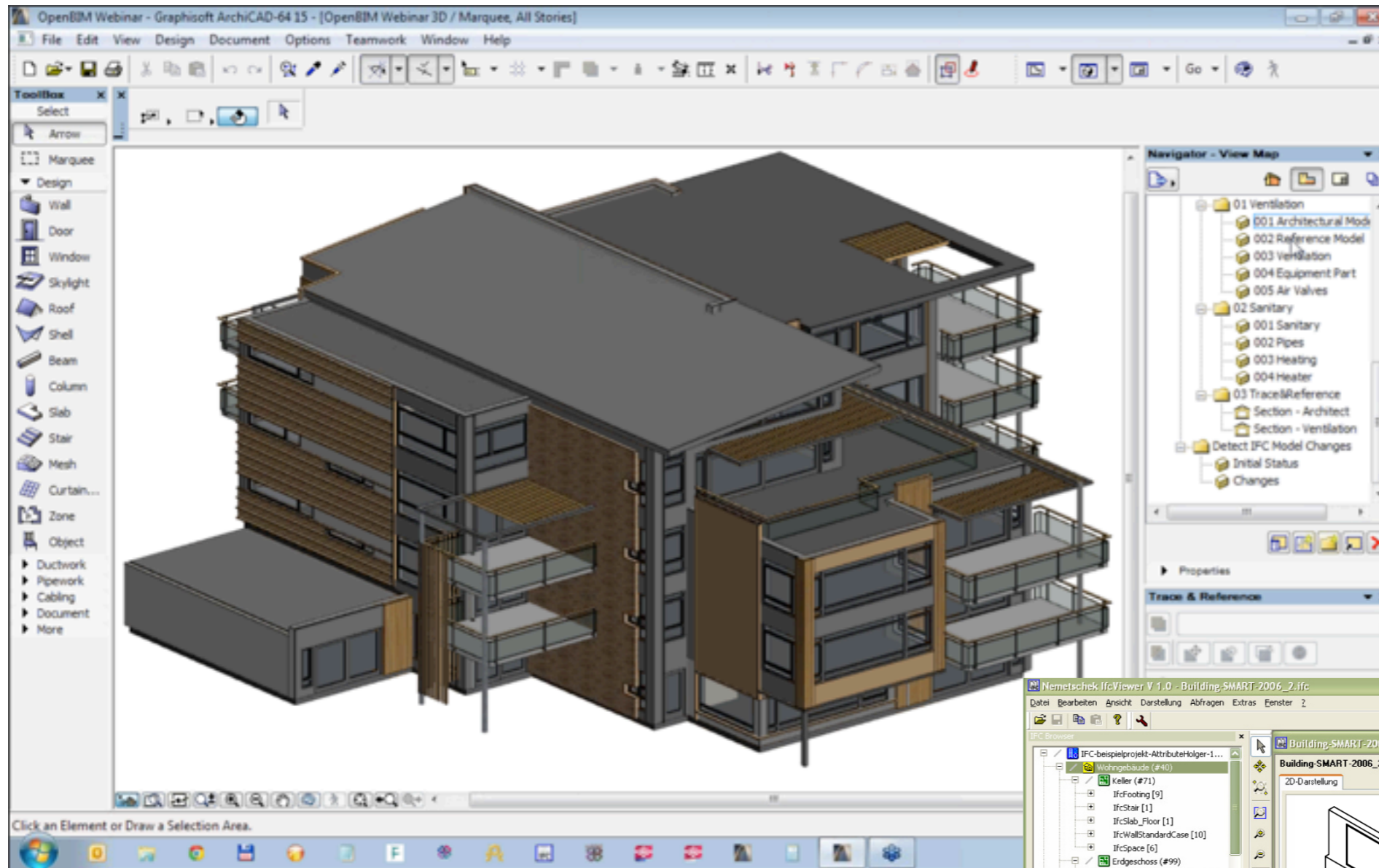


**Standard and non-standard elements**  
production of elements and macro-components



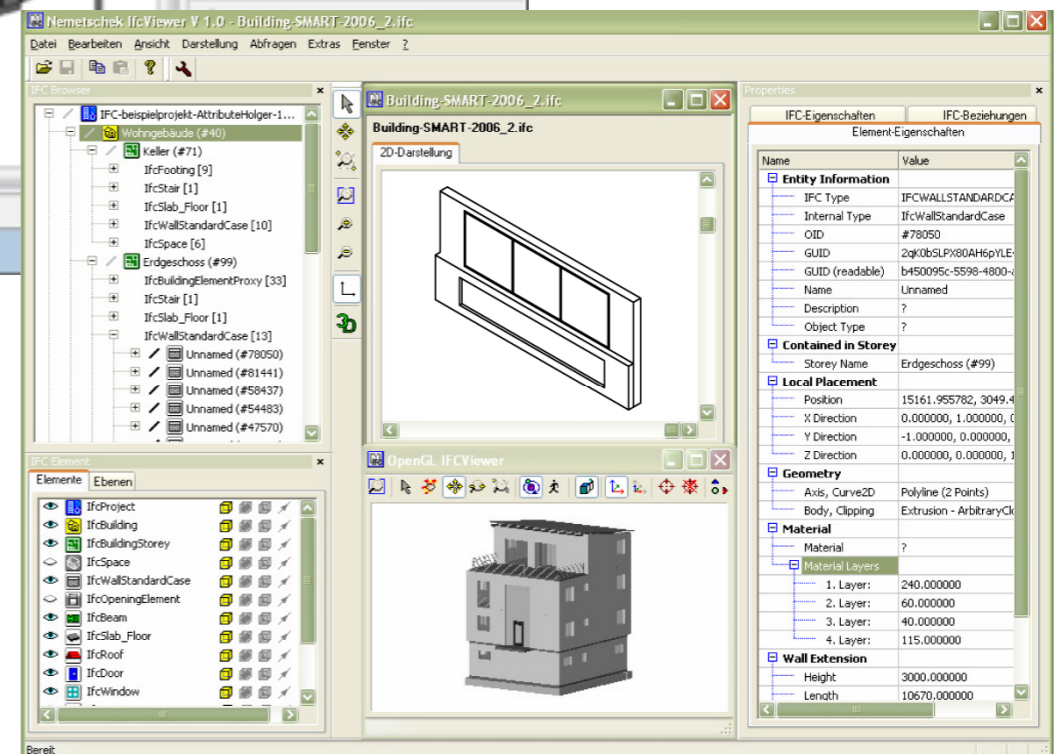


# 2. Digital Master Model



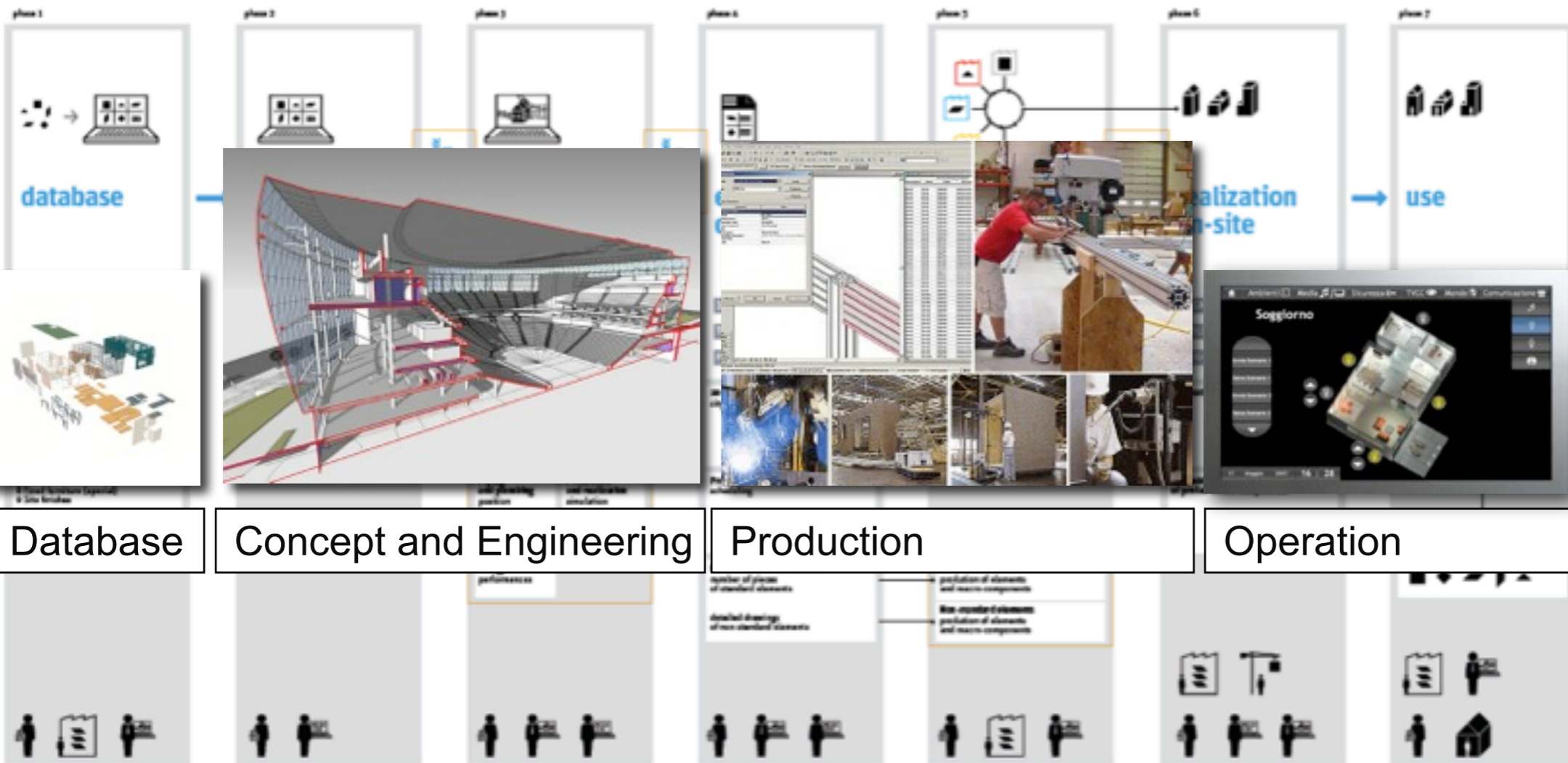
OPENBIM interoperable ontology and dataset (IFC)

Database of 3D prefabricated components with specific domain metadata



# 3. Product Life-Cycle Management

## interoperable PLM platform



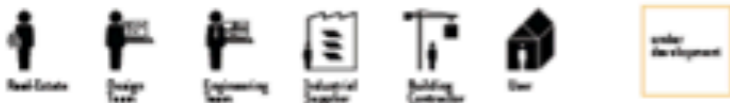
Database

Concept and Engineering

Production

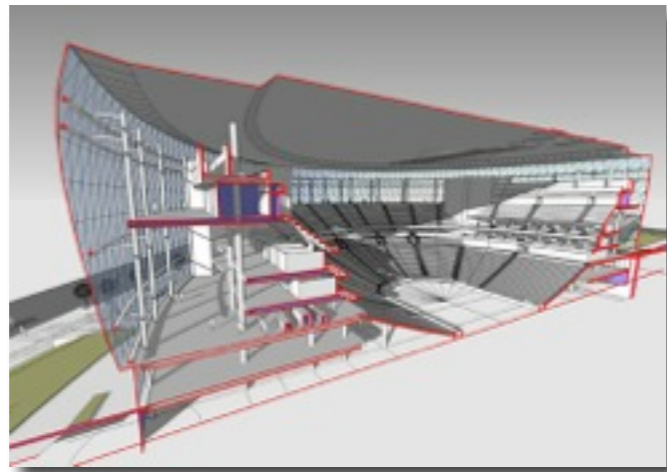
Operation

the life cycle management of a Green Prefab building collaborative software





# Engineering in the cloud



Concept and Engineering



## engineering and testing

**Form**  
checking position,  
immersive rendering

**Heating and ventilation**  
plants

**Structural**  
calculation

**Lighting**  
natural  
and artificial

**Piping and plumbing**  
position

**Production and realization**  
simulation

**Electrical**  
design of plants

**Computation of cost**  
automatic

**Energy**  
performances

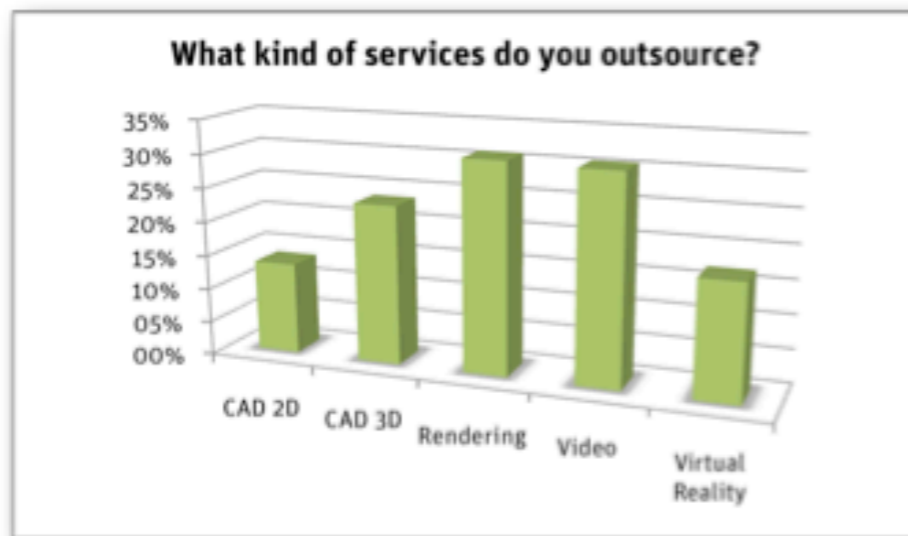
Porting into the cloud of 3D rendering visualisation apps



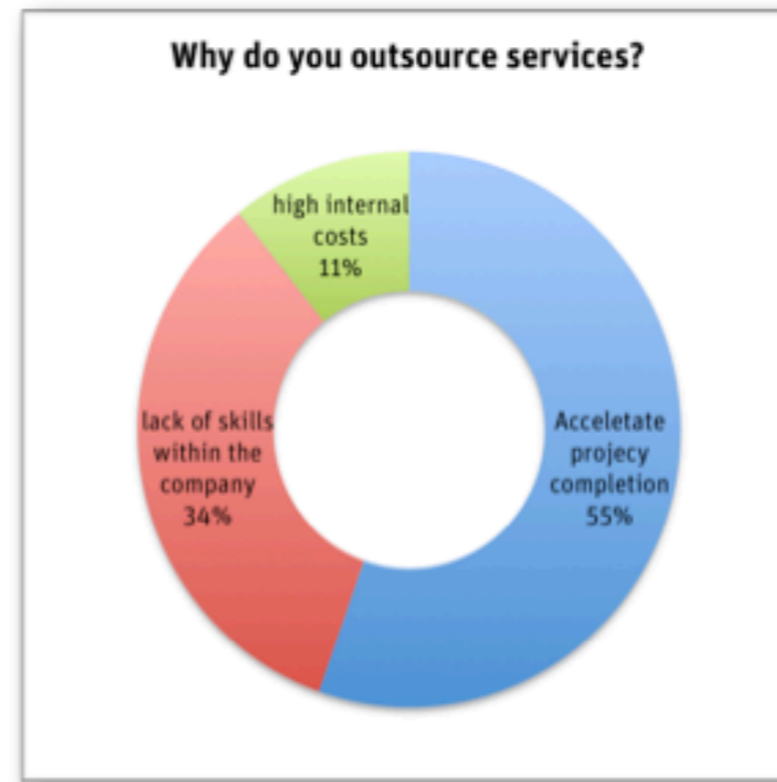
European Commission  
Innovation, Society and Media

# Community approach

428 professionals among **20,000 users of the greenprefab** community answered a survey



More of the 60% of the interviewees outsource services for rendering and video



Companies outsource:  
– to accelerate project completion 55%  
– for a lack of skill within the company 34%

## RESULTS:

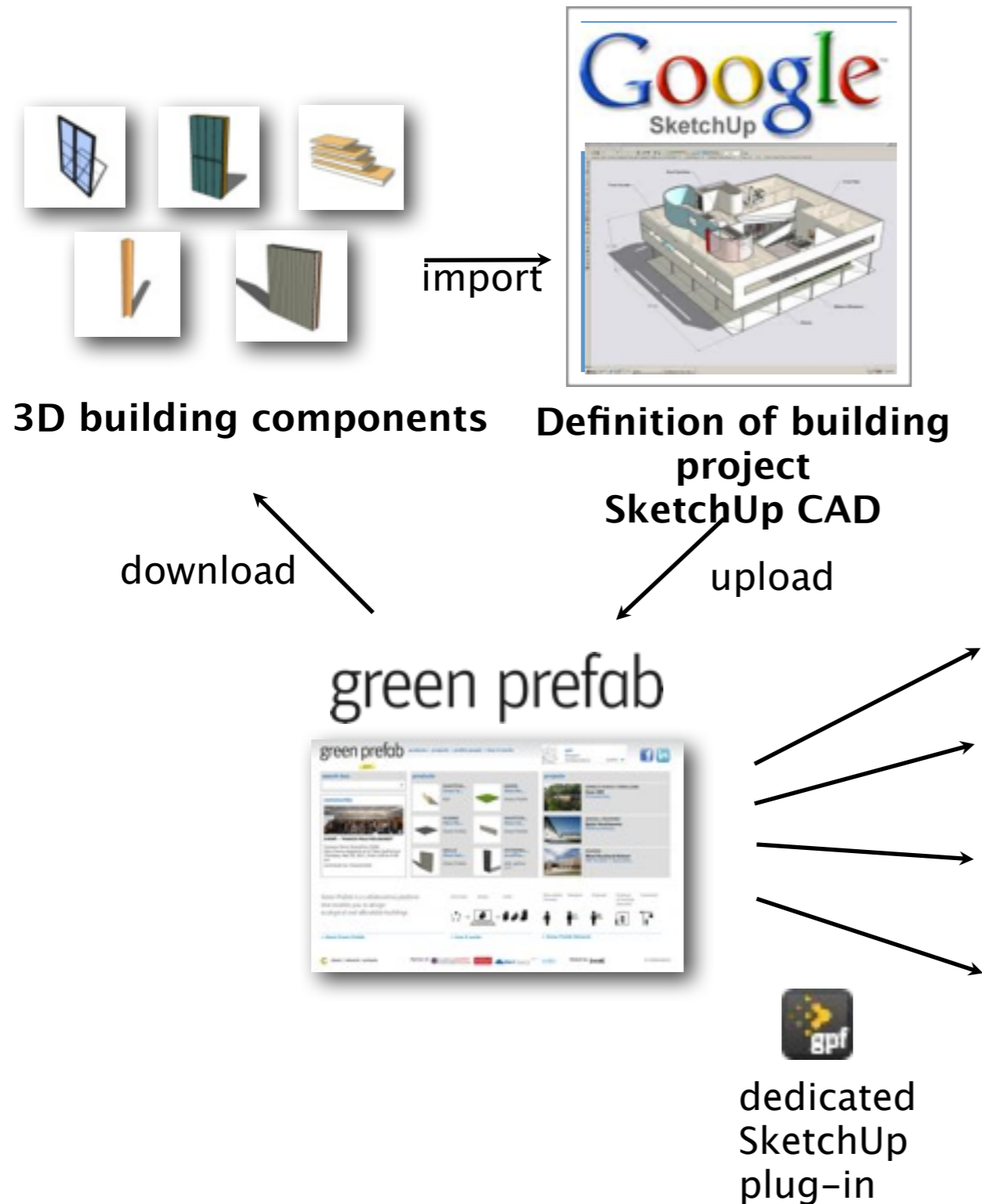


- A. Architects widely design in 3D (80%)
- B. 3D rendering services are outsourced in the most case
- C. Outsourcing is requested to speed up time of delivery

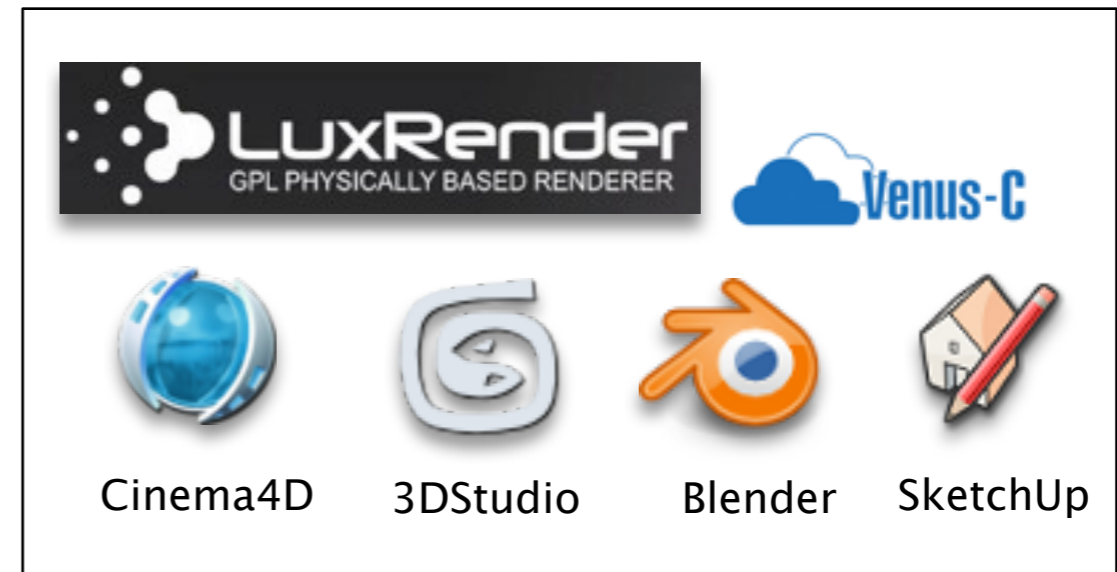


# Rendering Engine

greenprefab

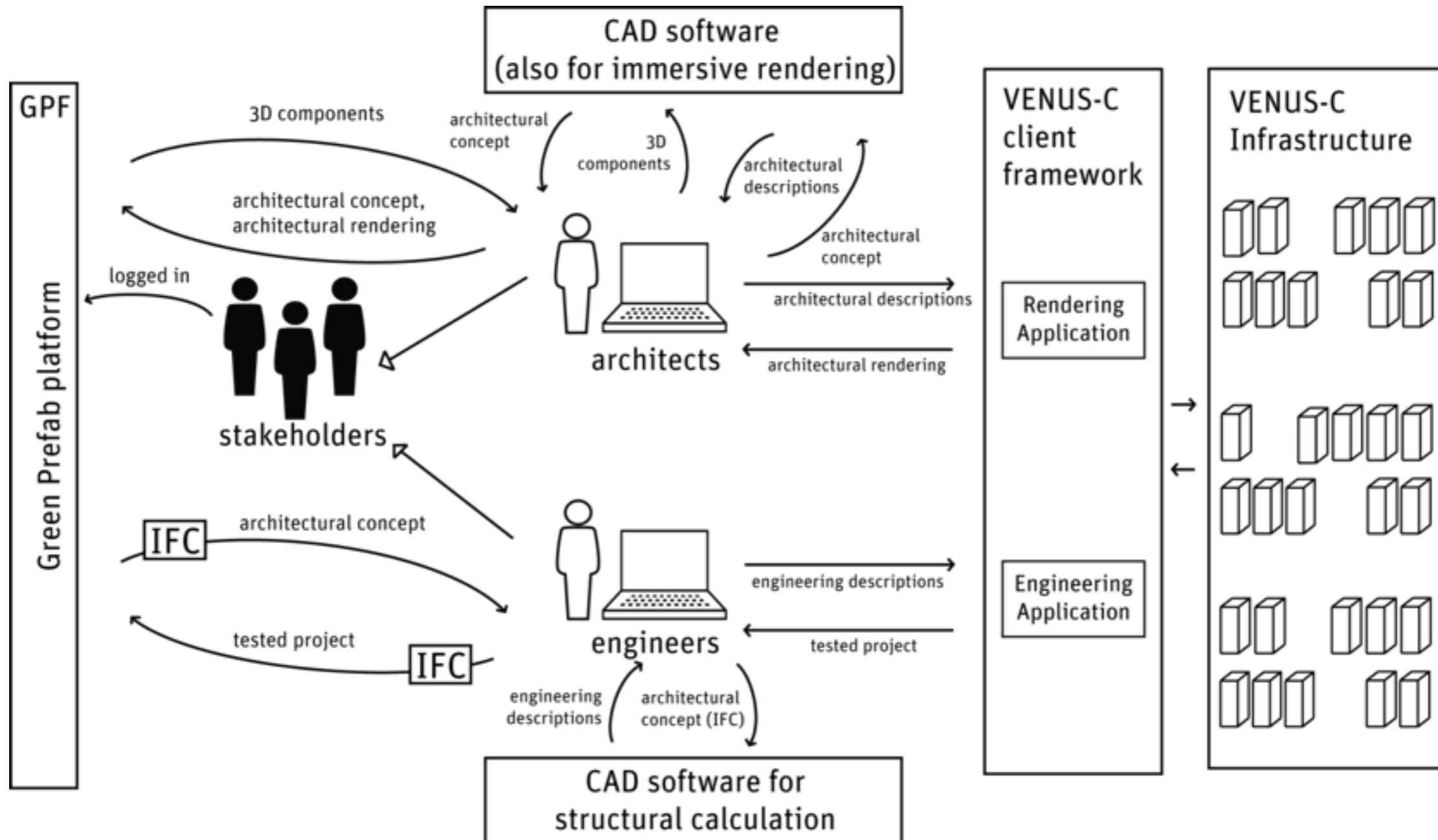


cloud rendered image



LuxRender: an open source rendering engine based on Ray Tracing algorithm for image synthesis.

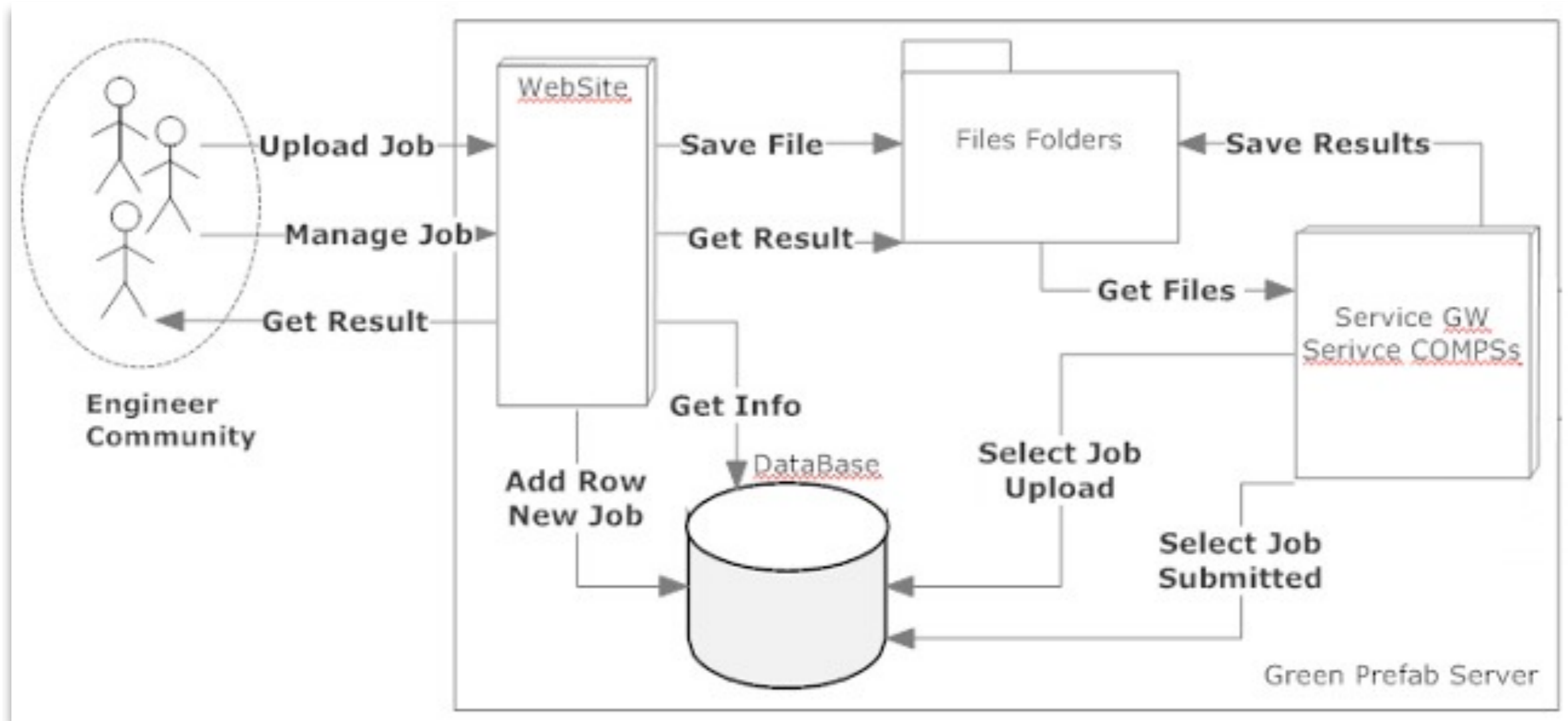
# Integration in GPF platform



GPF community and VENUS-C cloud resources

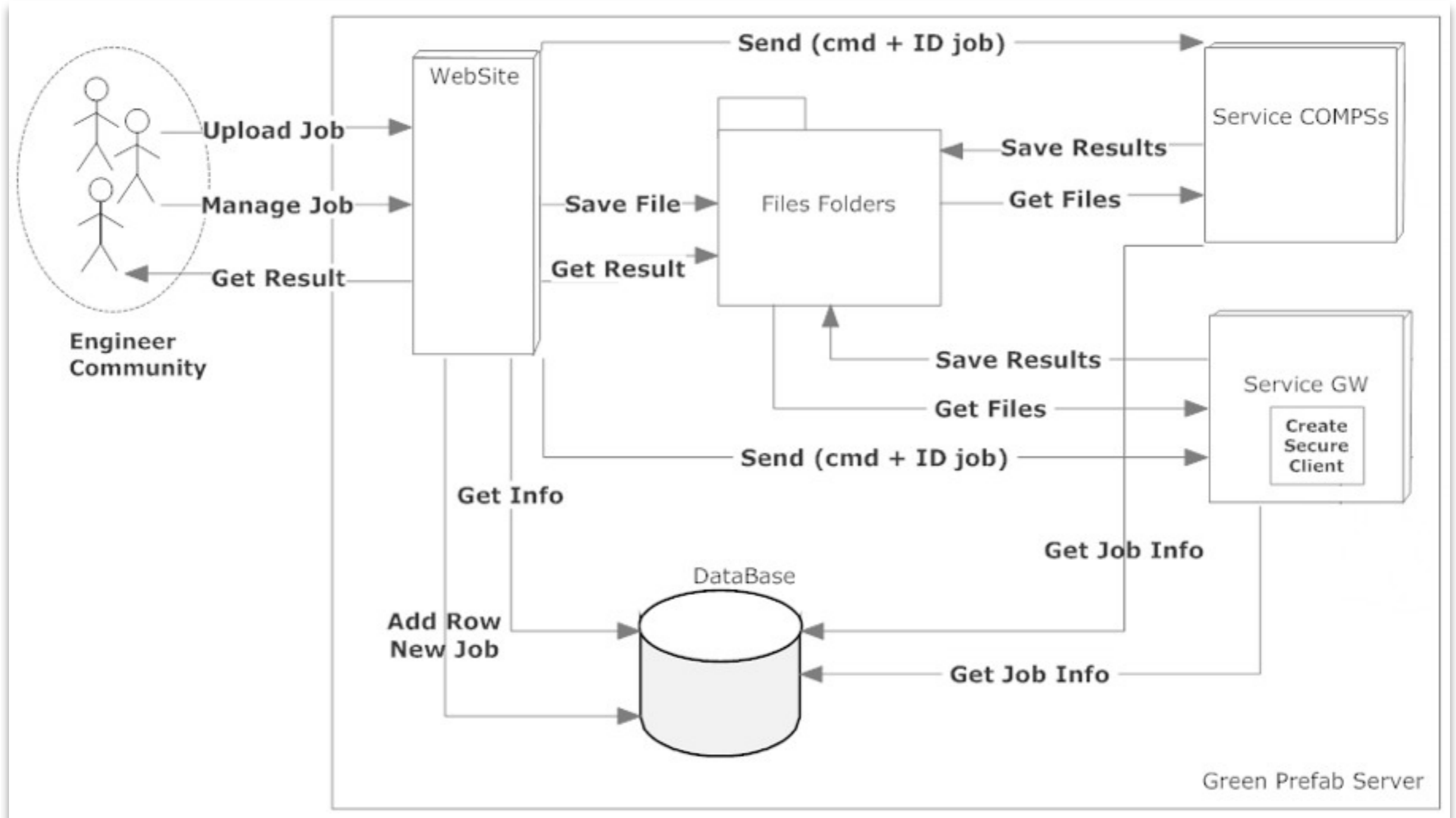


# HUB-E system architecture



Basic system architecture

# HUB-E system architecture

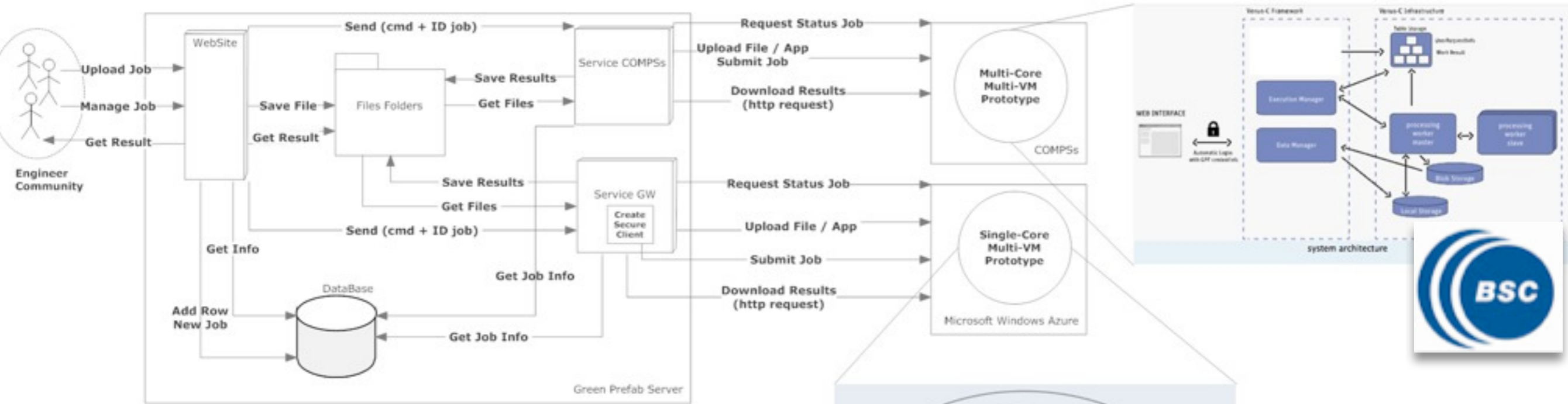


Multi-services system architecture

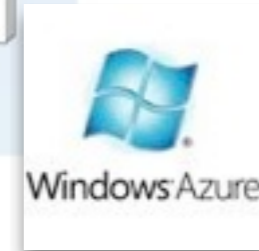
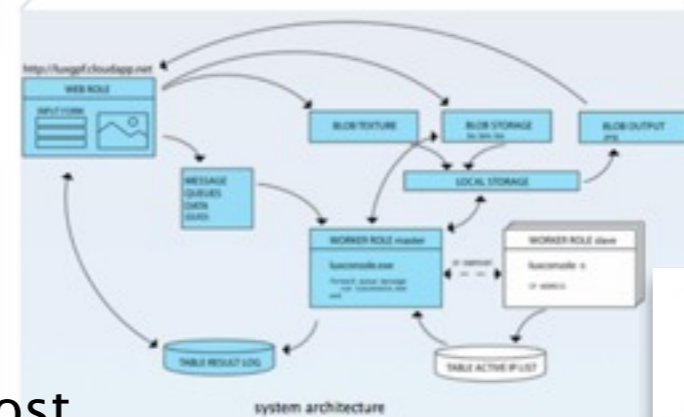


# HUB-E system architecture

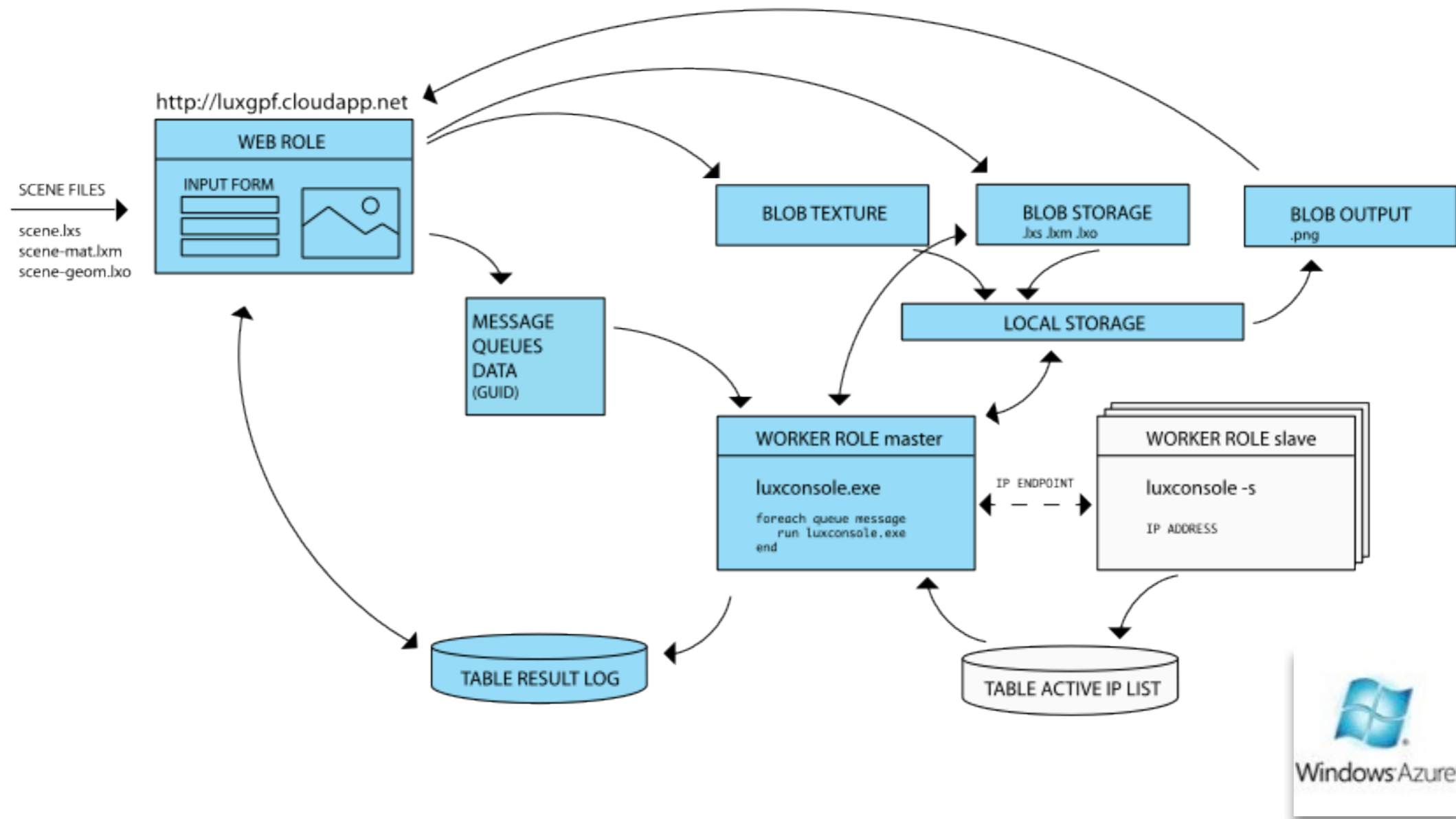
## Complete system architecture



- web-service in [www.hub-e.com](http://www.hub-e.com) server waiting for job request
- user submits a job (files + parameters)
- an asynchronous invoke calls the service, and post delivering ID of the job to be submitted
- This service, through ID, gets from MYSQL DB settings and from storage the files needed to submit data on Windows Azure
- During the execution of the service, the service itself updates data in HUB-e DB for user feedback
- Same service waits for the jobs completion to get result (= .png picture)



# HUB-E system architecture



MS Windows Azure architecture

# Business model rendering

greenprefab

Subscription: **free**



HIGH QUALITY PICTURE  
usage: \$ **WINDOWS AZURE**  
total cores: 32

- best for enterprise solutions
- better VM control
- flexibility

LOW QUALITY PICTURE  
usage: **free BSC**  
total cores: 80

- best for research purposes
- resource provider scalability
- easier to implement



The diagram illustrates the workflow of HUB-E in three steps: 1. UPLOAD YOUR FILES AND DATA, 2. ENABLE CLOUD COMPUTING, and 3. GET RESULTS. It includes a login/register form, navigation links, and the VENUS-C logo.

greenprefab HUB-E

## How HUB-E works

1 **UPLOAD YOUR FILES AND DATA**

2 **ENABLE CLOUD COMPUTING**

3 **GET RESULTS**

Login/Register

Services | About Us | Contacts

VENUS-C

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The screenshot shows the HUB-E dashboard with a user profile, navigation tabs, and a detailed 'Add a Job' form. The form includes fields for job title, file uploads (LXS, LXM, LXD, ZIP), render size, computational size, render quality, and quality settings.

greenprefab HUB-E

Welcome in your dashboard Nome Cognome | Edit profile | Logout

Service 1 | Service 2 | Service 3

### Add a Job

Upload your job and bla bla bla bla...

Job title:

Upload LXS file:   Nome\_file\_LXS\_carcato.txt

Upload LXM file:   Nessun file caricato

Upload LXD file:   Nessun file caricato

Upload ZIP file:   Nessun file caricato

**Render size**  
Here you can set width and height. Default size 1024x768 px.  
Width (px):   
Height (px):

**Computational size**  
Set the size of resources pool that will be used for rendering. For example the default value (small) means that 5 standard computer (with 2 cores) works simultaneously to generate your render image.  
 Small  Medium  Large

**Render quality**  
Set the time limit or the quality of the rendered image.  
Force to the limit (second):

**Quality**  
(Halfstep: sample per pixel)  
 Small  Medium  Large  
 Custom value (set value):

Search

Services | About Us | Contacts

f t in

VENUS-C

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# Quantitative validation sample

JobResult



Id  
36a75d4a-75f9-4821-8ed5-cd931d51c6a4  
Created  
3/4/2011 12:31 PM  
CreatedBy  
michele  
LxsFileName  
fullcornell.lxs  
LxmFileName  
fullcornell-mat.lxm  
LxoFileName  
fullcornell-geom.lxo  
LxoFileLength  
951507  
Haltspg  
1500  
Halttime  
0  
IsComplete  
True  
Finished  
3/4/2011 2:00 PM  
ElapsedTime  
5353  
LxsConsoleOutput  
[Output](#)  
CoreSize  
8  
InError  
False  
ErrorMessage



[Back to List](#)

- Input: (lxs+lxm+lxo) 10 MB + (zip) 0.3 MB
- Output volume (png): 1.6 MB
- Total Time: 14m 17s
- Render size: 1024 x 768 pixels
- Computational size: 8 core 4 vm
- Quality: High
- Cost: 0.42 € (0.42 € for computing, 0 € for storage and 0 € for transfers)

AVERAGE JOB  
< € 1,00  
< 10 minutes

# Current development

Green Prefab GPF developed [www.hub-e.com](http://www.hub-e.com), a prototype website to deliver cloud computing services for civil engineering integrated in the GPF system workflow.

The focus during the EU research period VENUS-C has been to explore a prototype integration of rendering visualisation.

Now the system is incorporating new tools.



# Next: Eco-efficiency analysis

## Pilot AOLSBD Online Assisted Sustainable Building Design

- training and technical support for porting in COMPSs
- integration in GPF PLM system
- connection to GPF community



engineering and testing

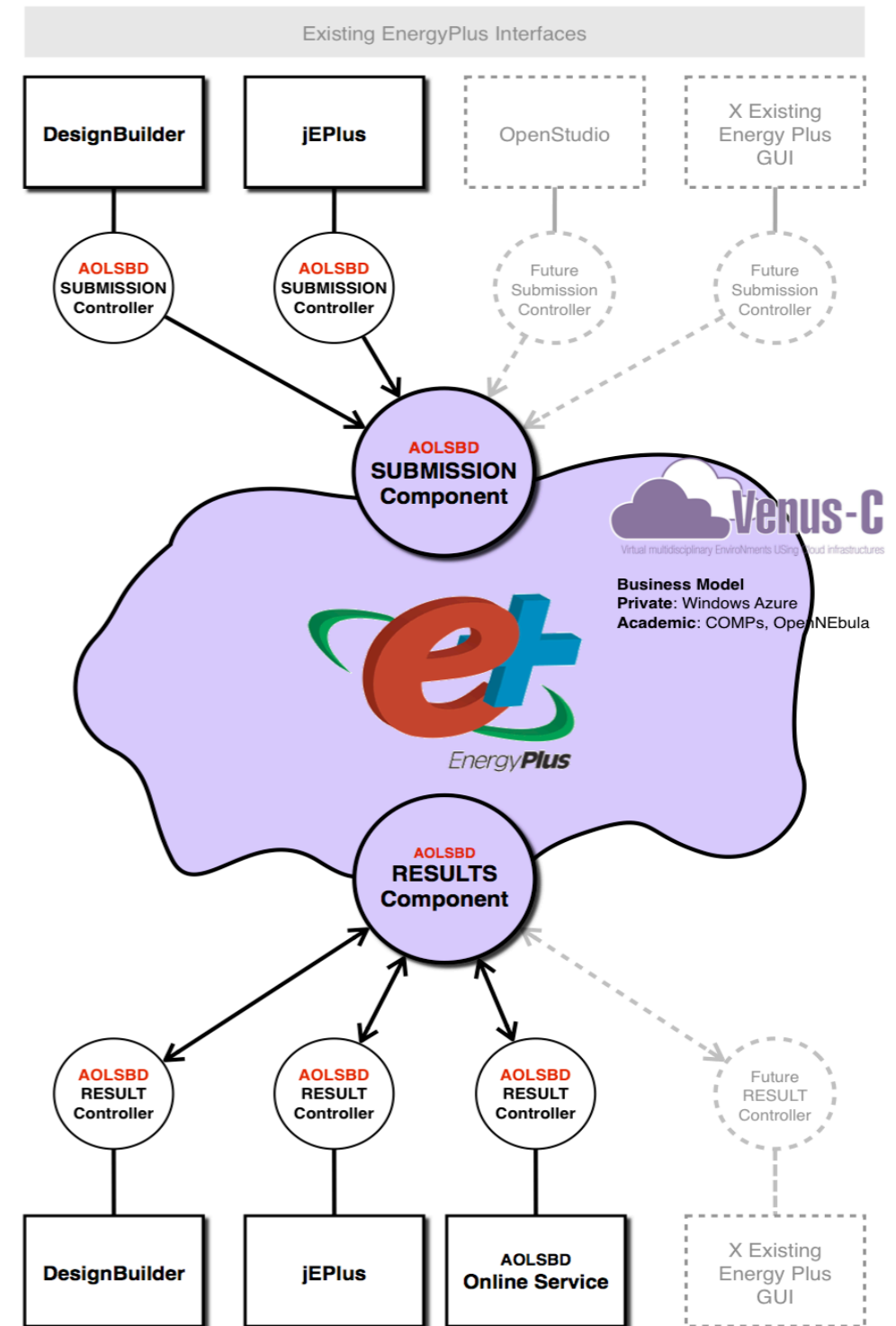
|  |   |
|--|---|
| <b>Form</b><br>checking position,<br>immersive rendering | <b>Heating and ventilation</b><br>plants        |
| <b>Structural</b><br>calculation                         | <b>Lighting</b><br>natural and artificial       |
| <b>Piping and plumbing</b><br>position                   | <b>Production and realization</b><br>simulation |
| <b>Electrical</b><br>design of plants                    | <b>Computation of cost</b><br>automatic         |

Energy performances

greenprefab



The Royal Danish Academy of Fine Arts  
Schools of Architecture, Design and Conservation  
School of Architecture



# Next: Eco-efficiency analysis

greenprefab



engineering  
and testing

Form  
checking position,  
immersive rendering

Heating  
and ventilation  
plants

Structural  
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Lighting  
natural  
and artificial

Piping  
and plumbing  
position

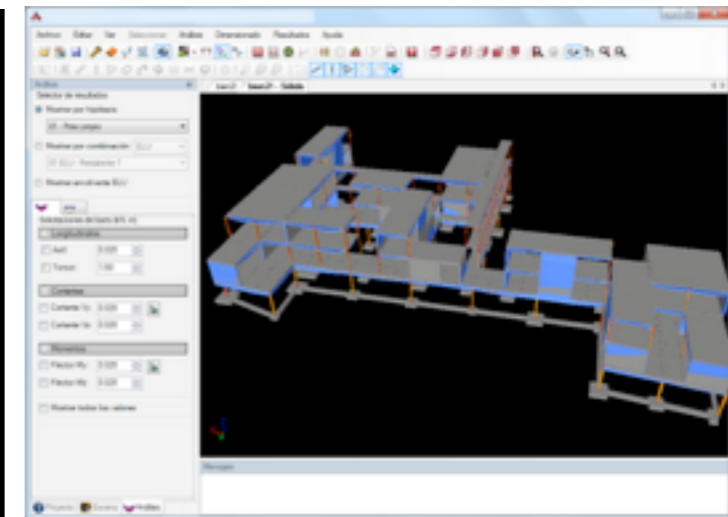
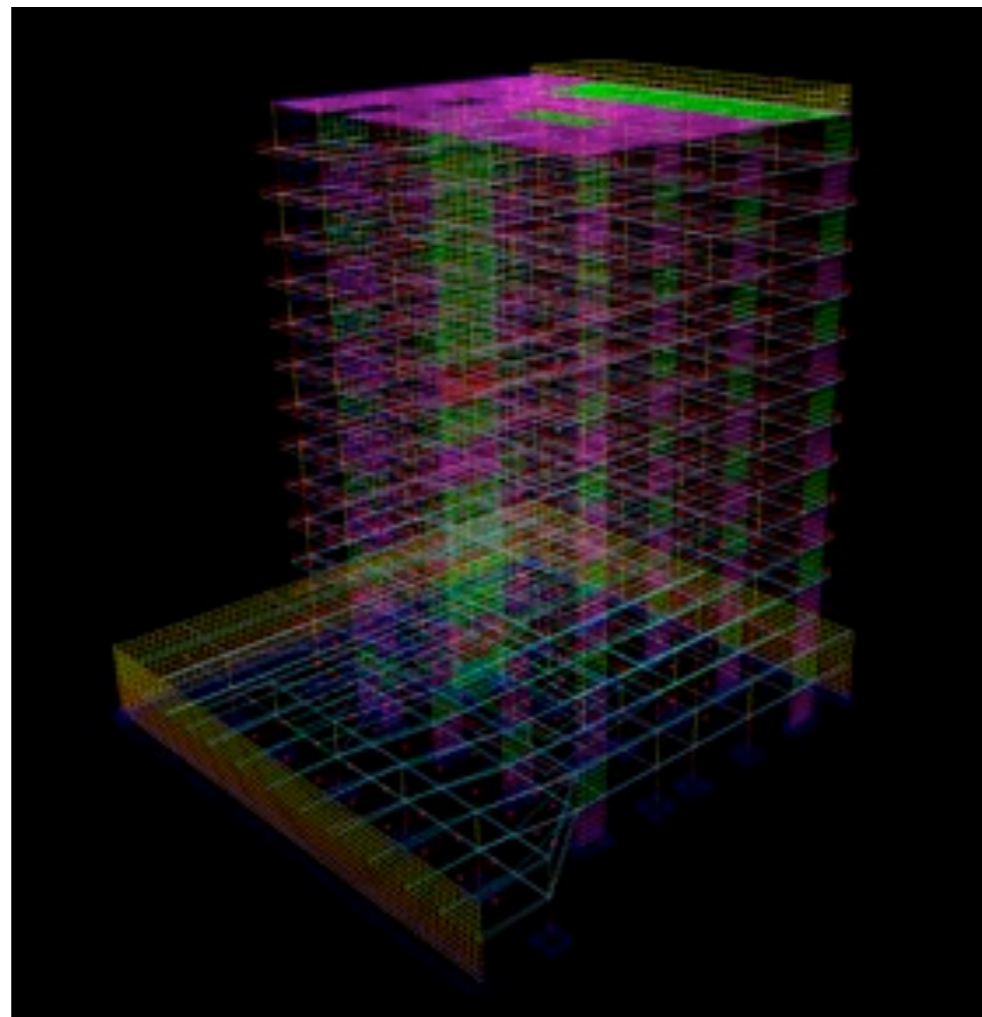
Production  
and realization  
simulation

Electrical  
design of plants

Computation  
of cost  
automatic

Energy  
performances

## STRUCTURAL CALCULATION Architrave by UPV on VENUS-C



greenprefab architrave



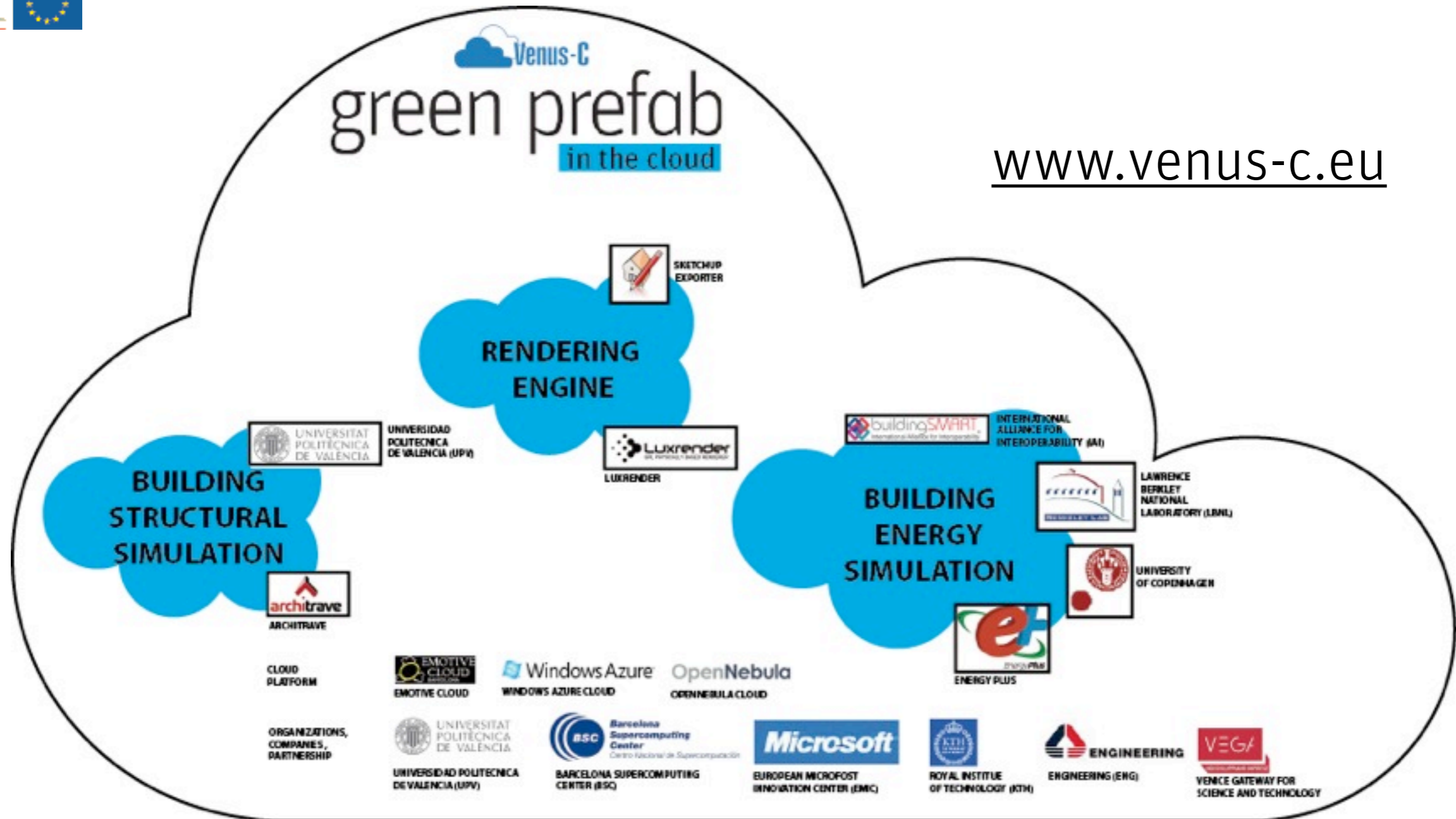
Microsoft  
Research



# VENUS-C: Green Prefab in the cloud



undergoing development, co-funded by the European Commission  
Framework Programme 7 (2010-2012) - Research infrastructures projects



World announcement: 7 May 2012 CLOUD FUTURES 2012  
End of VENUS-C project: 31 May 2012  
Launch of commercial HUB-E: 1 June 2012



# Background / The Management



## **Furio Barzon, Venice (Italy)**

- founder and CEO of **Collaboratorio** (think tank for innovation in digital architecture)
- founder and director of [www.architecture.it](http://www.architecture.it) (20,000 architects)
- Curator and producer of international events in architecture, author of articles and books, lecturer at International Universities
- Master Degree in Architecture at IUAV, Faculty of Architecture of Venice (Italy) 110/110



**Renzo Taffarello, Shanghai (China) and Palo Alto (USA)** CFO and marketing strategy (10% of equity)



# Background / Advisory Board



- **Prof. Vladimir Bazjanac**, U.S. Department of Energy (USA)  
Prof. of Building Technologies at Lawrence Berkeley National Laboratory, IFC standard founder
- **Prof. Qin Youguo**, Tsinghua University (China)  
former Dean and ICT expert
- **Ian Mc Nally**, ILT Solutions plc (United Kingdom)  
business accelerator, and ICT innovator
- **Paolo Privitera**, Pick1 (USA)  
Human Network Router



# Background / Established Relationships



EUROPE Venus-C Consortium  
**founding partner (European project, 4.5 M €)**

**PROGETTO MANIFATTURA**  
green innovation factory

ITALY Progetto Manifattura  
**Green Prefab Italia srl (founded September 2011)**

MACE  
Metadata for  
Architectural Contents  
in Europe

EUROPE MACE Consortium  
**founding partner (European project, 3.1 M €)**



GLOBAL International Alliance for Interoperability  
**User Group member (IFC full compatibility)**

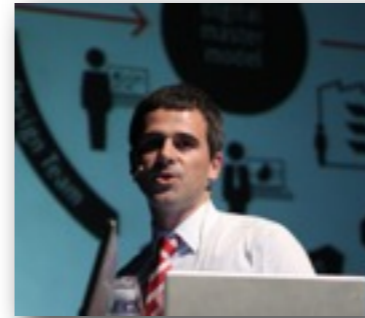
**ARCHITECTURE**<sup>IT</sup>

ITALY architecture.it  
**owned media (more than 20,000 architects)**

北京太空板业股份有限公司  
Beijing Taikong Panel Industry Corp.

CHINA Taikong Panel  
**industrial partner (customised version)**





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add me in:



see you in [www.greenprefab.com](http://www.greenprefab.com)

## Contacts

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fax +39 0464 443312

